

Seabrook Stormwater Treatment Evaluation Project Using the AbTech SmartSponge Plus®

Scott Nolan, University of New Hampshire
Natalie Landry, NH Department of Environmental Services
Steve Jones, Jackson Estuarine Laboratory, UNH

Project Partners

New Hampshire Department of Environmental Services
University of New Hampshire Jackson Estuarine Laboratory
New Hampshire Estuaries Project
Seabrook Department of Public Works
Seabrook Conservation Commission



New Hampshire Estuaries Project (NHEP)

NHEP Management Plan 2000

Water Quality Action Plan:
Research the effectiveness of innovative stormwater treatment technologies for highly urbanized areas.

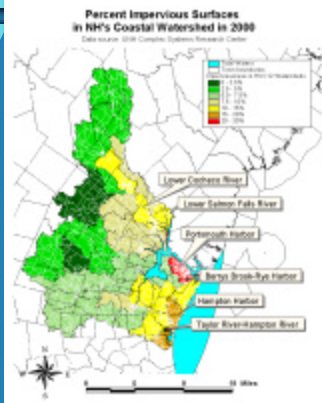


Project Goals

To evaluate the bacteria removal efficiency of the AbTech Industries SmartSponge® Plus installed as a stormwater retrofit BMP.

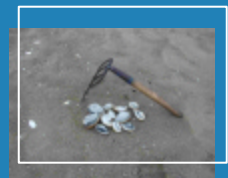
To develop a monitoring method for evaluating stormwater retrofit BMPs that reduce bacteria.

% impervious cover in NH's Coastal Watershed



Water quality impacts on shellfish beds

- Hampton/Seabrook Harbor was listed on the 2002 list of impaired waterbodies for shellfishing harvesting [New Hampshire 303(d)].
- Bacterial contamination during & following rain events results in shellfish closures.
- Stormwater was identified as a major source of bacterial contamination.



Hampton/Seabrook Harbor watershed

Highly urbanized watershed



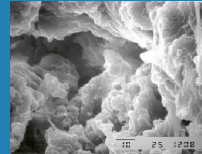
Shellfish Harvesting in Hampton/Seabrook Harbor

- Open Late Fall Through Mid-Spring
- Most productive clam resources in the state
- Rainfall Closures for 0.25" or more



How SmartSponge® Plus works

The SmartSponge® Plus has an antimicrobial agent bonded to the surface of its polymers



Close up



SmartSponge

Choosing a test site

the best fit for installing the AbTech SmartSponge Plus

The storm drainage system selected for testing the SmartSponge:

1. Was identified during pollution source survey.
2. Has a drainage area that is intensely developed and drains stormwater from a mostly residential area.
3. Has a drainage size consistent with the size of other drainage systems in the watershed.
4. Is near routine monitoring stations in Hampton/Seabrook Harbor.

Pre-installation water quality results

North Beach Neighborhood storm drainage system

| Site Description | Fecal coliforms (cfs/100 mL) | E. coli (cfs/100 mL) |
|--------------------|---------------------------------|-------------------------|
| Outfall | 22,560 | 22,500 |
| River St. WQ Inlet | 26,400 | 25,920 |
| Rt. 1A WQ Inlet | 16,000 | 15,920 |

Bacteria concentrations measured at various locations in the storm drain system were elevated.

Setup of the stormdrain

- The stormwater system is a series of pipes and catch basins on residential streets east of Route 1A and north of Hooksett Street.
- The system collects stormwater with leaching basins and pipes leading to a pump station by gravity.
- Stormwater flows through a 16-inch force main and ends in a plunge pool which drains to the salt marsh.



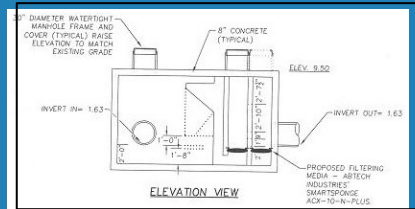
Stormdrain outfall & neighborhood





Monitoring the BMP

- The SmartSponge® material is located in an existing water quality inlet upstream of the pump station.
- Auto-samplers are located above ground and collect samples through pre-existing access points.





Project Design

- Evaluate pollutant removal efficiencies based on water quality and quantity data collected during 15 rain events during the fall and winter of 2003/04.
- Pollutants to be measured include three bacterial indicators (E. coli, enterococci, fecal coliform). Conductivity and pH will also be measured.

US EPA Environmental Technology Verification Program Verification protocol for Stormwater Source Area Treatment Technologies Draft 4.1 Publication (ETV)

See ETV Draft 4.1 http://www.epa.gov/etv/pdfs/vp/04_vp_stormwater.pdf

Why use these indicators?

Fecal coliform = shellfish harvesting standard

E. coli = freshwater recreation standard (swimming & boating)

Enterococci = tidal water recreation standard (swimming & boating)

Preliminary Results from three storm events

Percent reduction of bacterial concentration using the SmartSponge®

| Storm Date | Precipitation (inches) | Reduction Fecal coliform | Reduction E. coli |
|------------|------------------------|--------------------------|-------------------|
| 9/4/2003 | 1.0 | 0% | 0% |
| 9/16/2003 | 0.5 | 67% | 68% |
| 9/24/2003 | 1.5 | 32% | 28% |

Stormwater: Fecal coliform range 21,800-134,000 cfu/100 mL
E. coli range 11,000-122,500 cfu/100 mL

Percent reduction of bacterial concentration using the SmartSponge®

| Storm Date | Precipitation (inches) | Reduction enterococci |
|------------|------------------------|-----------------------|
| 9/4/2003 | 1.0 | 39% |
| 9/16/2003 | 0.5 | 59% |
| 9/24/2003 | 1.5 | 17% |

Stormwater: enterococci range 9,000-50,000 cfu/100 mL

Conclusions

1. A method for evaluating stormwater retrofit BMPs that reduce bacteria has been developed & was approved by the EPA.
2. The bacterial removal efficiency of the AbTech Industries SmartSponge® Plus is currently being evaluated. Preliminary data show mixed results.

Contact Information:

Scott Nolan, UNH 603-781-2216 snolan@metrocast.net

Steve Jones, UNH, (603) 862-5124 shj@cisunix.unh.edu

Natalie Landry, NHDES, 603-433-0877
nlandry@des.state.nh.us and www.des.state.nh.us

AbTech Industries <http://www.oars97.com/>

Project Costs

| | |
|---|-----------------------------|
| Engineering | 20,000 |
| SmartSponge Plus | 4,000 |
| Salaries (PI & Technician) ¹ | 55,000 |
| Travel | 725 |
| Equipment ² | 14,620 |
| Supplies | 3,225 |
| Laboratory | 750 |
| | \$98,320³ |

¹ Staff time was used to develop method and monitor events.

² Equipment can be used in future projects.

³ Municipal staff time not included in budget.